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EC02-1252 Introduction to Water Gardening

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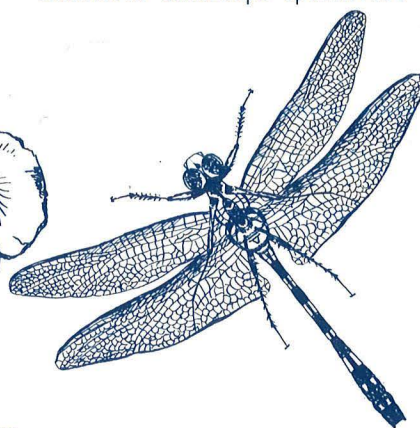
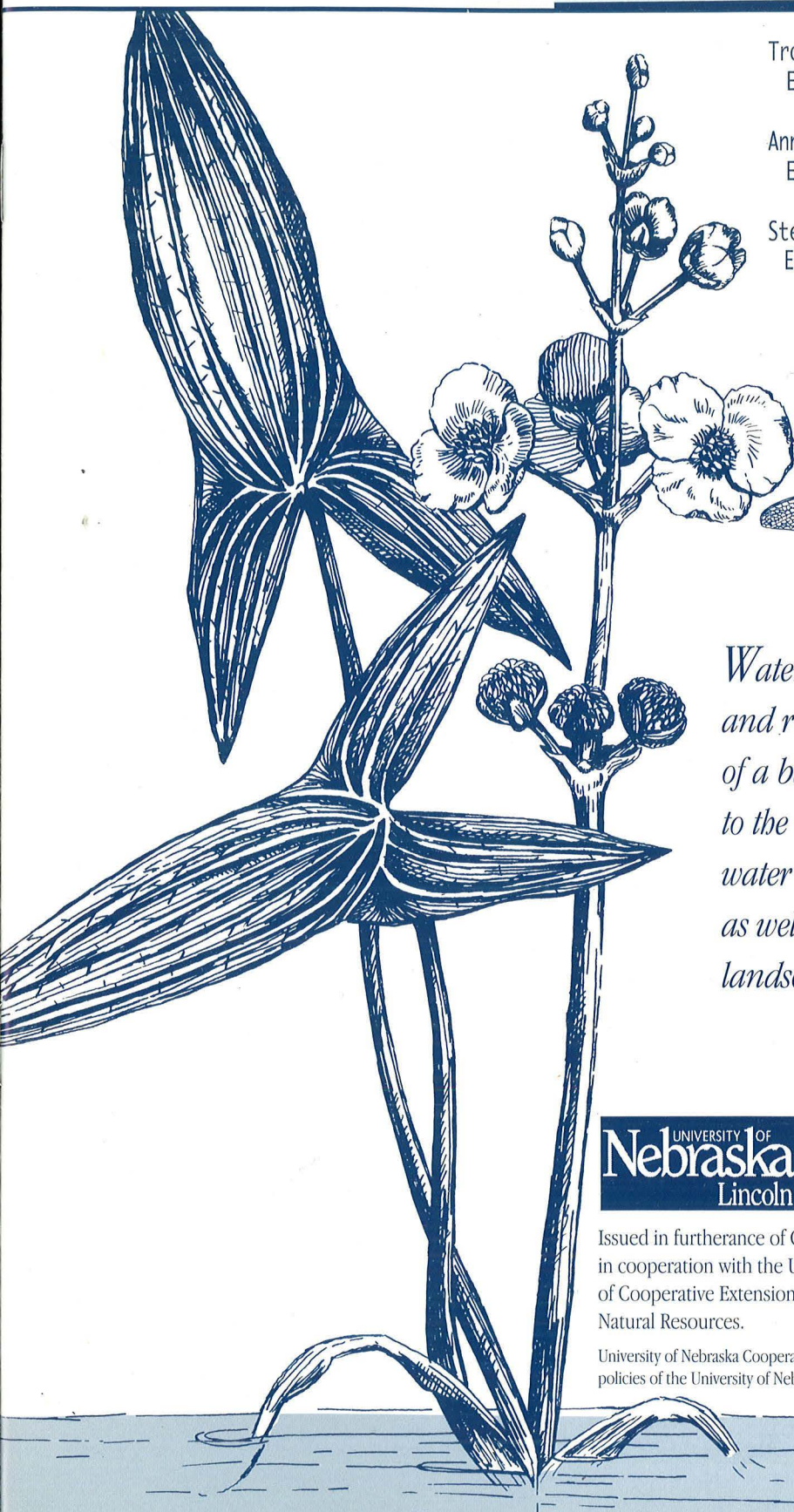
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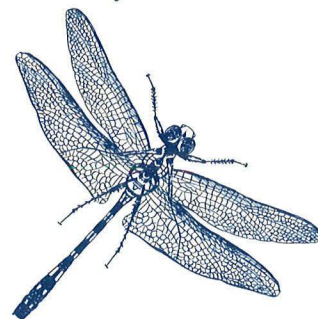
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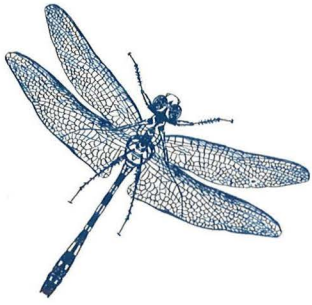
Water gardening can be a fun, enjoyable, and relaxing experience. From the sounds of a babbling brook, waterfall, or fountain to the visual beauty and fragrance of a water lily, water gardens add a focal point as well as an interesting feature to your landscape.



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LOCATING and constructing the water garden

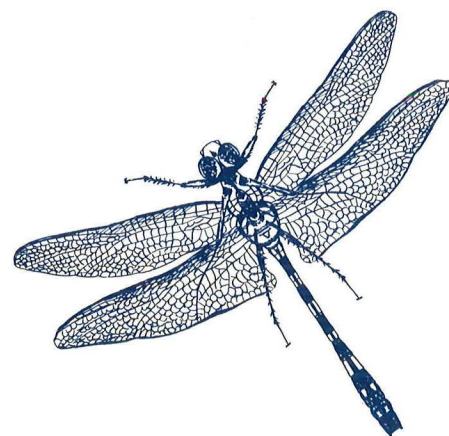
When selecting a site for a water garden, always choose a site that is located near a convenient water source. Consider placing it near a patio, deck or important window so it can be easily seen and enjoyed. Avoid sites that are exposed to constant wind unless provisions to shield the garden can be made. Most water gardens feature flowering plants that require at least six hours of full sun each day. Areas that receive less sun than that can minimize blooming on plants chosen specifically for their flower (water lilies and lotus). In yards that are heavily shaded, there are still several options.

Nonflowering plants with attractive foliage (such as taro) can be grown, a pond can be developed for fish only, or a reflective pond can be developed. Ponds located near deciduous trees or tall shrubs having large leaves or flowers will need regular maintenance to remove fallen leaves.

The base of containers located above ground (such as a half whiskey barrel) should be shaded to minimize water heating from the sun. To accomplish this, place potted plants around the base of the container. Tropical plant material may perform better than hardy plant material in this warm water. If a whiskey barrel is used, it should be lined with plastic or an insert due to the toxic substances found in the wood as a byproduct of distilling.

In-ground ponds need to be situated in an area that does not receive water runoff from gutters, driveways or landscape plantings. Ponds in these locations are very difficult to maintain due to the excess nitrogen, nutrients and debris that may flow into them.

In-ground ponds are constructed using either a preformed plastic liner (insert) or a flexible liner that can be formed to almost any shape. When using a flexible liner, create a shape that complements the existing design theme of the landscape. Formal shapes can be installed, but soft-curved natural shapes such as that of a kidney or peanut are most commonly used. A garden hose or string can be used to outline the shape. Observe the shape from several different directions to ensure that it is aesthetically pleasing from the most accessible viewing locations. Preformed inserts should also be observed from several key viewpoints before deciding on a final location. After the location for the pond has been identified, the edges can be marked using powdered



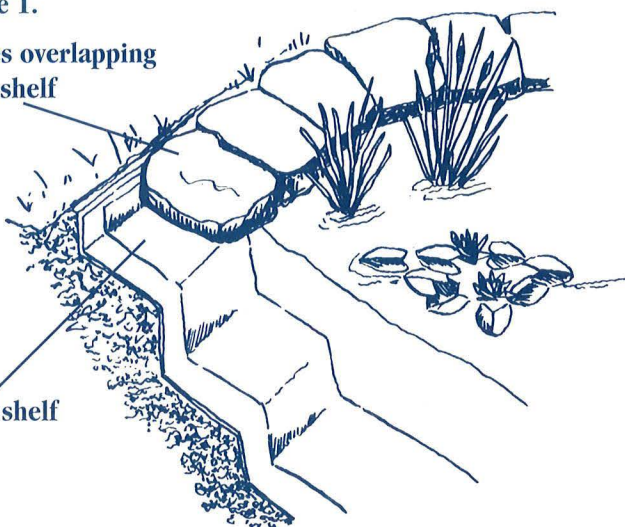
chalk or spray paint. The following points should be done before digging the hole:

- All utility companies should be notified by calling the diggers hot line ((800) 331-5666) to ensure that utility lines will not be hit when digging the pond.
- The surrounding pond landscape should be fenced off if small children live in the area.
- Local government regulations should be checked for code restrictions.
- All electrical power going to the pond should have a ground fault interrupter installed by a qualified electrician. Do not cut corners by trying to install the electrical power yourself.

Figure 1.

**Stones overlapping
liner shelf**

Liner shelf



When digging the hole for either the preformed liner or flexible liner, start digging from the inside of the hole and work out to the edges, forming the soil to the desired shape and diameter of the pond. Most preformed liners have a 12 to 15 inch wide shelf around the edge of the pond that sits approximately 12 to 15 inches below the water level for shallow water or bog-type plants (Figure 1). Plants can be supported by bricks or flat rock if the preformed liner does not have this shelf. Sandstone rock, however, should be avoided because it will break down over time. This shelf will need to be constructed when using flexible liners. The deepest part of a pond should be 15 to 24 inches deep. This depth is sufficient to over-winter fish and hardy plant material.

A slight tilt or low spot may be incorporated into one side of the pool rim to direct excess water out of the pool. In a large water garden, installation of an overflow drain may be a good idea. The surface of the dug hole should be covered with an underlay material (landscape fabric, sand, carpet, insulation or cardboard) that will cushion the liner, preventing any unseen rocks or roots from damaging it. Liners should be at least 35 to 40 millimeters thick. The best liners are made of butyl rubber. A vinyl liner will work but won't last as long as liners made of butyl rubber and may become brittle when exposed to sunlight. Air pockets below the liner should be smoothed out and any wrinkles or overlaps straightened before water is added. The amount of liner needed can be estimated by calculating the following:

1. Measure the length, width, and depth of the pond (in feet).
2. Add twice the pond's depth (2d) to each of the dimensions plus an extra allowance of one foot of overlap (more overlap can be added to be on the safe side).

Example: A pond is 10 feet long by 15 feet wide and 2 feet deep. How much liner will be needed?

$$10 + (2 \cdot 2) + 1 = 15 \text{ feet for the length of the liner.}$$

$$15 + (2 \cdot 2) + 1 = 20 \text{ feet for the width of the liner.}$$

A 15 by 20 feet piece of liner will be needed for this project.

After the pond is filled, the edge of the flexible liner should be cut if it extends more than 12 to 15 inches past the edge of the pond. There should be at least 12 inches of excess to prevent leaking from the pond. Let the liner settle for about a week to ensure no further settling occurs before cutting excess from the edges. Once the liner is cut, stone or brick should be placed on the upper part of it, extending a short distance past the edge of the liner. This will protect the liner from direct sunlight and hide it from view as well as aesthetically define the edge of the pond.



When selecting a pump size for a waterfall or fountain, it is better to oversize a pump than undersize it. The total water volume in a pond should be circulated every two to three hours. Circulation allows for oxygenation of the water, which helps fish breathe as well as cuts down on algae buildup. Low oxygen levels may cause ammonia buildup and ultimately fish death.



To calculate the size of the pump needed, refer to the following formula and examples to first determine the water capacity of the pond.

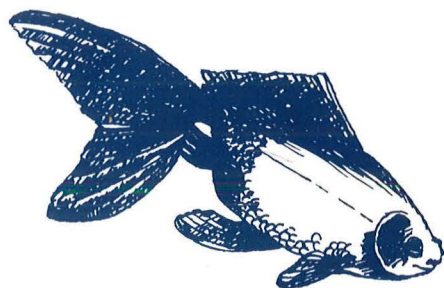
1. Find the volume of your pond in cubic feet.
For a rectangle or a square shape multiply: length · width · depth.
For a circle multiply: $\pi * \text{radius} \cdot \text{radius} \cdot \text{depth}$.
*Note $\pi = 3.14$
2. Once the volume of the pond is determined, multiply by 7.5. This will equal the total number of gallons in the pond.

Example A: A circular pond is 8 feet wide and has two levels. The first level is 6 feet wide and 1 1/2 feet deep. The second level is 8 feet wide and 1 foot deep.
First level: $3.14 \cdot 3 \cdot 3 \cdot 1.5 = 42.39$ cubic feet.
Second level: $3.14 \cdot 4 \cdot 4 \cdot 1 = 50.24$ cubic feet.
Total pond volume = 92.63 cubic feet.
 $92.63 \cdot 7.5 = 694.73$ gallons.
The pond would require a pump size of 350 gallons per hour.

Example B: A rectangular pond has the following dimensions, 10 feet x 12 feet x 2 feet.
Volume: $10 \cdot 12 \cdot 2 = 240$ cubic feet.
 $240 \cdot 7.5 = 1,800$ gallons.
This pond would require a pump size of 900 gallons per hour.

It is important to also add the total water volume of any additional tanks or waterfalls associated with the pond to correctly calculate the size of pump that will be needed.

PLANT selection



When selecting plant material, keep two considerations in mind. For ponds that receive more than six hours of full sun, 60 percent to 70 percent of the pond surface should be covered with plant material

to reduce the amount of heat gain as well as the amount of available light for algae to grow. Secondly, ponds should have one bunch or group of submerged plants per 1 to 3 square feet of pond surface.

Tropical Water Lily and Hardy Water Lily (*Nymphaea* spp.)

Tropical water lilies perform very well in water gardens as long as they receive a minimum of six hours of full sun and the water temperature is above 70°F. They are usually treated like annuals in Nebraska because they are difficult to overwinter. Hardy water lilies begin to grow when water temperatures reach approximately

50°F and flower much sooner than tropical lilies. Unlike hardy water lilies, tropical water lilies have a very fragrant aroma. Tropical lilies also differ from hardy lilies in that the flower stalk is usually held 4 to 6 inches above the water. Hardy lilies can hold their flowers above the water but are usually found at the water's surface. Tropical water lilies flower in many different colors including white, pink, blue, purple, yellow and red. Hardy water lily flowers also come in a variety of colors but lack true blue and true purple. After water lilies have completed blooming, the flower stalks should be removed. This not only keeps the pond clean, but also promotes continued flowering.

Tropical lilies are split into two groups, day-blooming and night-blooming. Day-blooming lilies have flowers that open in early morning and close by mid-afternoon. In most cases, day-blooming lilies are slightly smaller than the night-blooming lilies. Night-blooming lilies usually open in late afternoon, depending on the amount of light, and close in early morning. Hardy water lilies are only day-blooming.

Neither hardy nor tropical water lilies like moving water. They prefer calm water and should be located out of any areas in the pond where the constant splash of fountain spray or falling water can cause leaf rot and discoloration.

Lotus (*Nelumbo nucifera*)

Lotus is an ancient, hardy, shallow-water bog plant. Lotus leaves usually extend 12 to 18 inches above the top of the water. Lotus flowers bloom in pink, white, orange, purple, and yellow.

Bog or Marginal Plants

Bog or marginal plants can be either hardy or tropical. They are usually found on the edge of the pond, with 1 to 4 inches of water above the top of the pot. A few examples of hardy bog plants include cattail (*Typha* spp.), arrowhead (*Sagittaria latifolia*) and water pickerel (*Pontederia cordata*). Tropical bog plants include parrot's feather (*Myriophyllum aquaticum*), water poppy (*Hydrocleys commersonii*), water canna (*Canna* x Longwood Hybrids), water snowflake (*Nymphoides indica*) and taro (*Colocasia* spp.).

Submerged or Oxygenators

Submerged or oxygenating plants can either be placed throughout the water garden and allowed to free float below the surface of the water or planted in

a pot on the bottom of the pond. Oxygenators should be stocked at a rate of one bunch per 1 to 3 square feet of pond surface. Oxygenators help absorb excess nutrients in the water, reducing the amount available for algae growth. Oxygenators also release oxygen and provide good habitat for fish to lay their eggs and for small fish to hide. Some of the most common oxygenators include anacharis (*Elodea canadensis*), cabomba (*Cabomba caroliniana*), hornwort (*Ceratophyllum demersum*), and vallisneria (*Vallisneria spirilis*).

Floating Plants

Floating plants do not require soil. They simply float on the surface of the water and extract nutrients from the water. Duckweed (*Lemna minor*) is the only floating plant hardy in Nebraska. Other floating plants that can be used, but are not hardy in Nebraska, include water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), azolla (*Azolla filiculoides*), and salvinia (*Salvinia auriculata*). Both water hyacinth and water lettuce produce long root systems (sometimes as long as 12 inches or more) and are very good at extracting excess nitrogen from the water, thus aiding in algae reduction.



PLANT installation



Planting should be delayed one to two weeks after the pond is filled. This allows the chemicals in treated city water to dissipate. With the exception of floating plants and oxygenators, all plants are contained within pots or planting baskets. Placing plants in containers not only allows easy movement within the water garden, but also helps to reduce the amount of soil particles found in the water, making the job of obtaining clear, clean water much easier. When planting water lilies, lotus, and bog plants, it is very important to use a clay loam soil, free of clumps and organic matter that may float. Avoid any herbicide-contaminated soil.

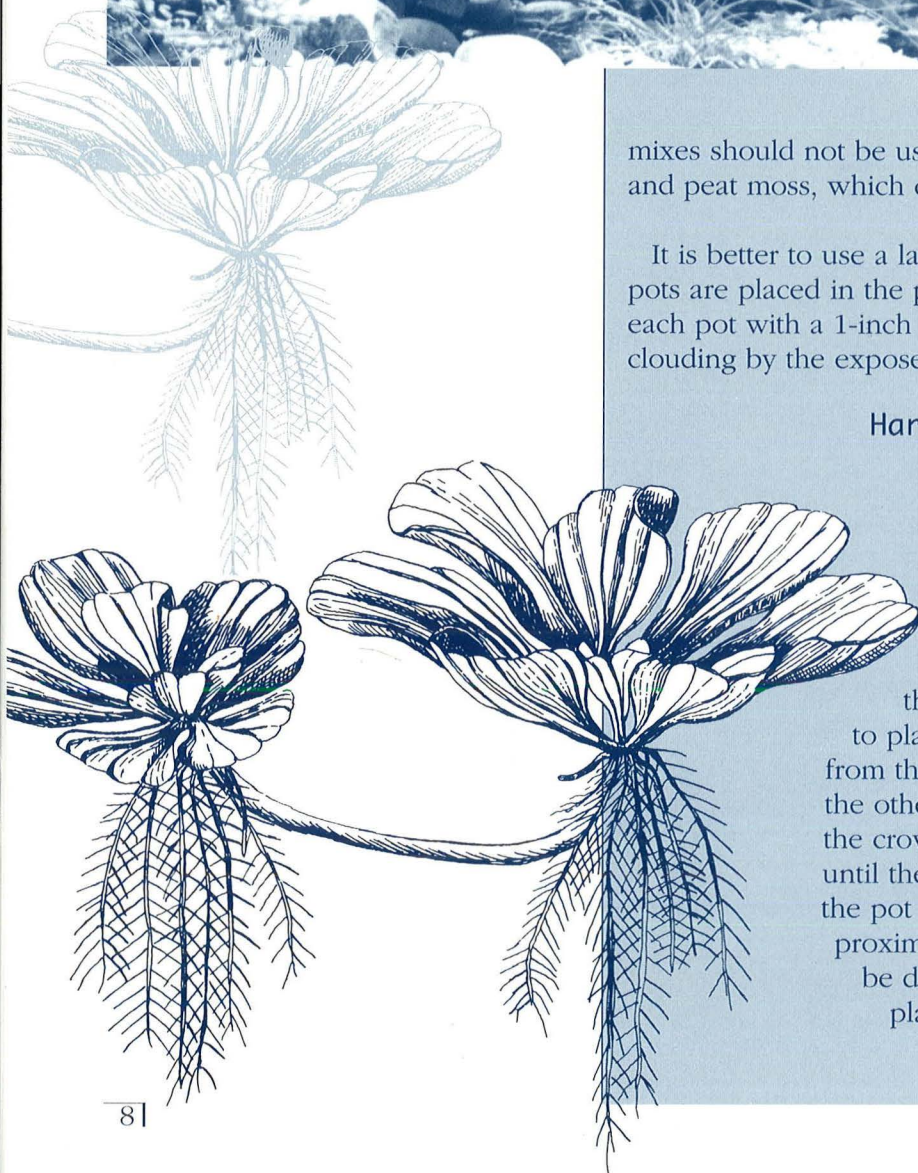
Commercial potting mixes should not be used because they contain vermiculite, perlite, and peat moss, which can float out of the pot.

It is better to use a larger pot than one that is too small. Once the pots are placed in the pond, it is very important to cover the top of each pot with a 1-inch layer of sand or pea gravel to avoid water clouding by the exposed soil.

Hardy Water Lilies

Hardy water lilies are grown from tubers that are typically 4 to 8 inches long and can have several growing points. Using a large pot (12 inches or larger), fill the pot one-quarter full with soil. Holding the tuber in one hand, angle it at a 45-degree angle with the end of the growing tip pointing upward. Try

to place the tuber in the pot so the end farthest from the crown or growing point is directed toward the other side of the pot. This allows ample room for the crown to grow. Fill the soil in around the tuber until the soil is about 2 inches away from the top of the pot with the crown sticking out of the soil approximately one-half to 1 inch. Hardy water lilies can be divided after several years to provide more plants.



Tropical Water Lilies

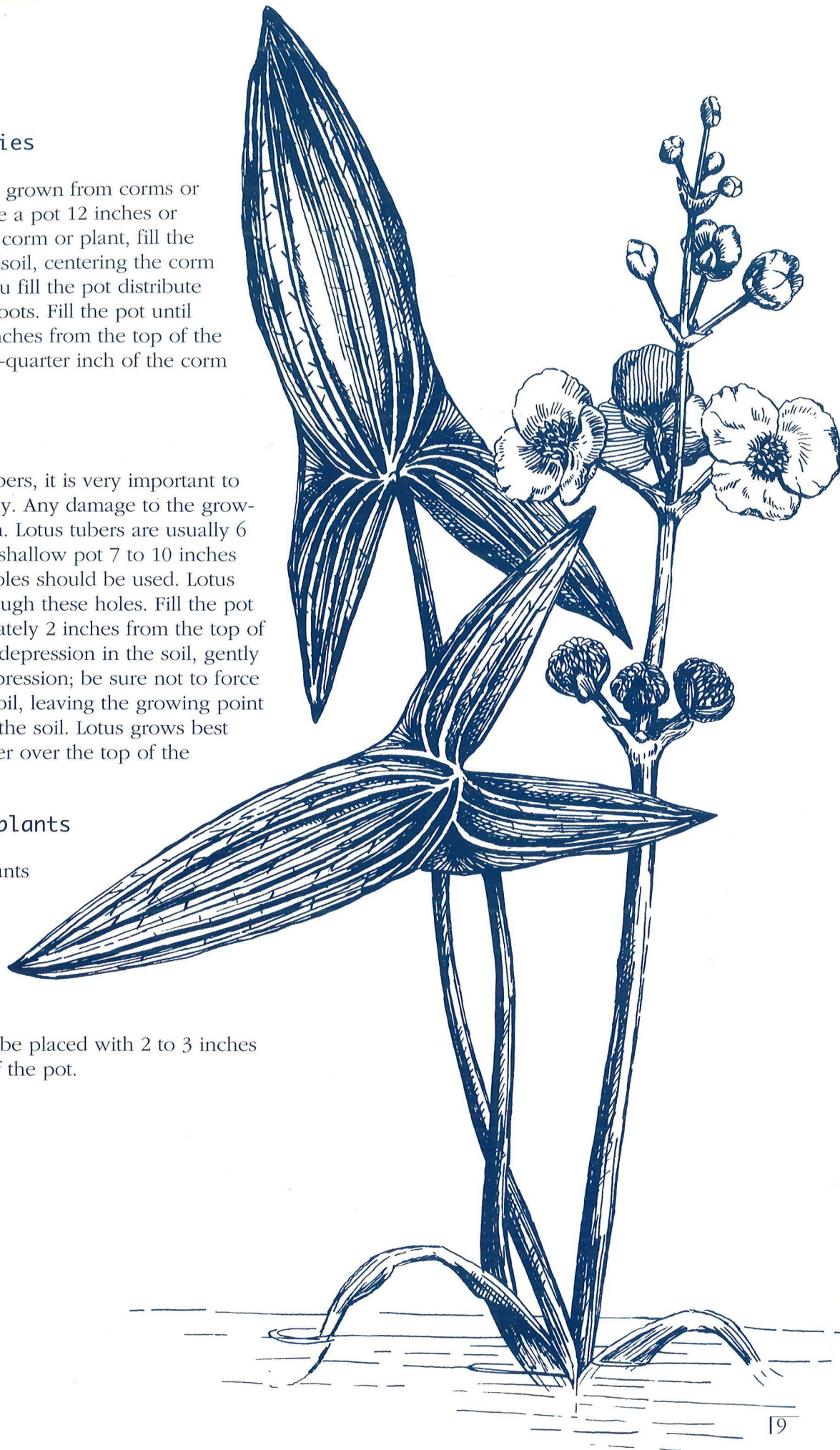
Tropical water lilies are grown from corms or plants. When planting use a pot 12 inches or larger. While holding the corm or plant, fill the pot half full of clay loam soil, centering the corm or plant in the pot. As you fill the pot distribute the soil evenly over the roots. Fill the pot until the tip of the corm is 2 inches from the top of the pot. Be sure to leave one-quarter inch of the corm above the soil surface.

Lotus

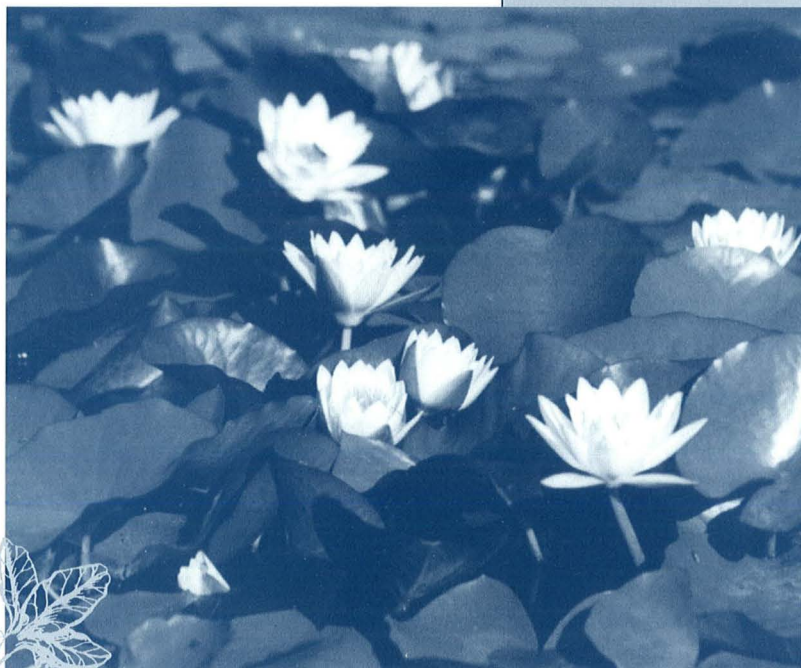
When planting lotus tubers, it is very important to handle the tuber delicately. Any damage to the growing point can cause death. Lotus tubers are usually 6 to 9 inches long. A large shallow pot 7 to 10 inches deep with no drainage holes should be used. Lotus rhizomes can escape through these holes. Fill the pot until the soil is approximately 2 inches from the top of the pot. Forming a small depression in the soil, gently place the tuber in the depression; be sure not to force it. Cover the tuber with soil, leaving the growing point one-half to 1 inch above the soil. Lotus grows best with 4 to 6 inches of water over the top of the pot.

Bog and submerged plants

Bog and submerged plants should be planted like a houseplant, keeping the soil 2 inches from the top of the rim. One inch of soil or pea gravel should again cover the soil, and the pots should be placed with 2 to 3 inches of water above the top of the pot.



POND Maintenance



Early season

Clean the pond each year in early spring, after the water temperature reaches 50°F. Carefully remove the fish and place them in a container away from the pond. It is very important to use water that is the same temperature as the water in the pond; even a small difference in water temperature can shock and kill the fish. Be sure to place a screen over the top of the container to prevent them from jumping out. Hardy plants should also be removed before cleaning the pond.

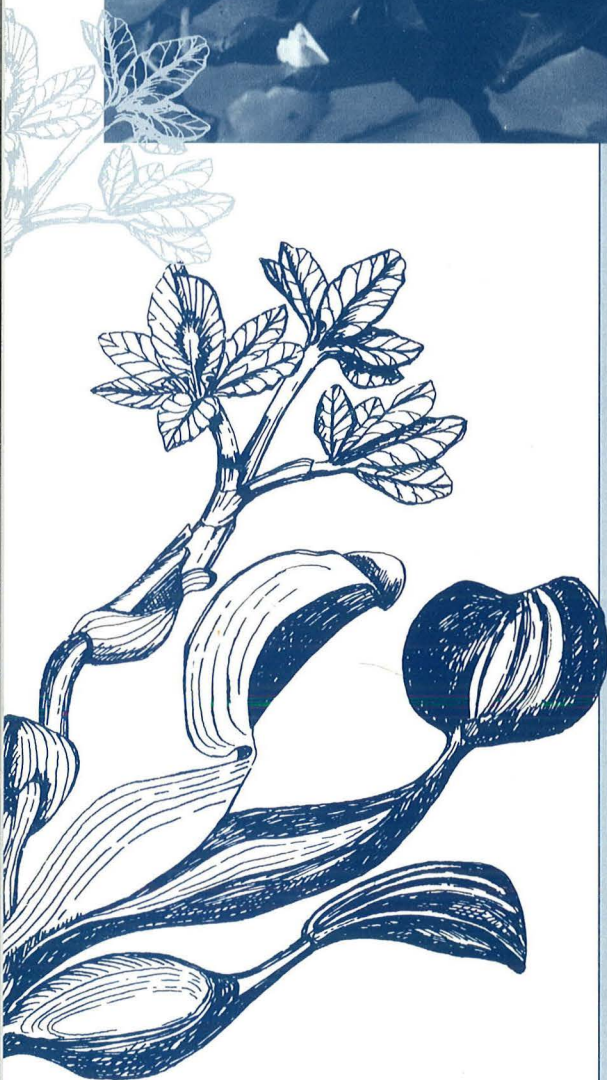
Once the fish and hardy plants are removed, drain the pond and scoop out the debris. The debris can be placed around other plants in the yard for fertilizer or put into a compost pile. Covering or incorporating it into existing mulch or compost can minimize the strong odor of the debris. Use a strong stream of water to clean the edges of the pond. Leave a small amount of algae on the side of the pond to absorb excess nutrients. This will reduce the chance of a large algae build up. Do not use soaps and detergents. Once cleaned, refill the pond.

Before returning any plants or fish, wait a week or two until the chemicals of city water have dissipated, or use a water treatment (such as Chloramine Buster® or Pure Pond®) to neutralize these chemicals. It is very important to wait until the water temperature is the same in both the pond and in the bucket holding the fish before returning the fish to the pond. Before the plants are returned to the pond, remove dead leaves or stems.

Mid-season

Throughout the growing season, remove water plant leaves that turn yellow or unsightly. If left to decay on their own, they can cause an anaerobic condition in the water, causing fish to die, as well as causing the pond's water to become cloudy or murky.

Water lilies (especially tropical) and lotus are heavy feeders during their peak growing period (late June to early August). Fertilize water lilies and lotus with a fertilizer high in phosphorus (eg. 10-15-10) to promote flowering. A fertilizer high in nitrogen may lead to algae growth and fewer flowers. When the water temperature is above 74°F,



they should be fertilized every two weeks. Bog and oxygenator plants should be fertilized once a month. Push the fertilizer below the surface of the soil, using either fertilizer tablets made for water lilies/water plants or plant spikes for flowering plants. Fertilizing is the key to having a healthy blooming plant. In early September, when the water temperature begins to dip, stop fertilizing and allow hardy plant material to prepare for the onset of cold temperatures.

Late season/winter

With the onset of fall, several things must be done to prepare the pond for winter. Nonhardy plant material that is going to be overwintered in the house should be taken in before the water temperature falls below 60°F. Apply preventative broad-spectrum insecticide to the leaves before the plant is moved into the house to ensure that mites, aphids or other insects do not damage the plants or spread to other houseplants. After the first hard frost, any nonhardy plants left in the pond should be removed and discarded.

Hardy plants should have their tops cut back and placed in the deepest part of the water garden where they will overwinter until next spring. The pond must be a minimum of 15 inches deep for the plants to overwinter. If the pond is too shallow for overwintering, these plants should be pulled from the water

garden and allowed to dry down for a few days near the edge of the pond. After drying down, place them in a plastic bag and store in a cool area (50°F or lower) that does not freeze. Check the bag occasionally to ensure the plants do not dry out.

An opening in the pond ice will need to be provided if fish are being overwintered. This opening will not only allow gases to escape from the pond, but it also will attract birds and other wildlife during the winter months. The best option is a small floating stock tank heater that prevents the pond from totally freezing over (Figure 2). Depending on the size of the heater, a 1- to 2-foot opening should stay ice free throughout the winter months. Another method is to siphon off a small amount of water after the ice has formed to create an insulating layer of warmer air below the ice. Never chip a hole through the ice as the shock waves can kill or injure the fish in the pond. As a pond freezes, the ice will expand and put pressure on the liner, especially if the liner is rigid. One method to reduce this stress is to place a floating object in the water before it freezes, such as wood or Styrofoam.

In the case of an above-ground pond, drain the water and store the plant material as previously mentioned. It is very important that the water be fully drained. Expanding water can severely damage an above-ground pond.

Figure 2.

A small floating stock tank heater prevents the pond from completely freezing.



PEST control



Insects and Diseases

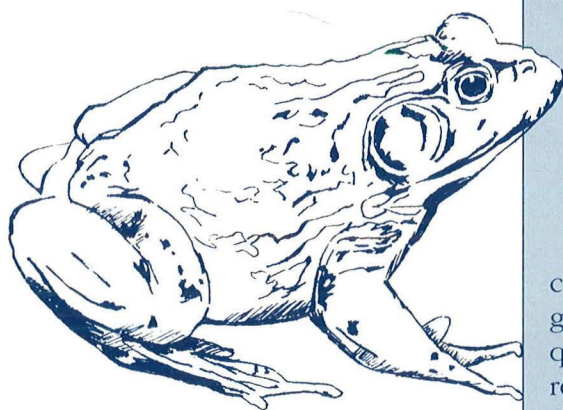
One of the major pests of water gardens is aphids. Aphids are easy to control if fish or other life forms are not in the pond. Sevin® or Malathion® will easily control them but can kill fish or other animal life in the pond. The best control can be achieved if the plant is potted and can be removed from the pond, at which time a thorough insecticide control can be applied. Aphids also can be controlled by using a strong stream of water from a garden hose to knock them into the water where they can be eaten by the fish. For a heavy infestation, a 10 percent solution of vegetable oil or dish soap and water can be applied to the aphids with a hand sprayer. Aphids are very prolific and require repeated applications.

Spider mites can pose a problem on certain plants within the water garden (eg. cattails, taro). Mites also can be controlled using a strong stream of water. If a heavy outbreak occurs, an insecticide such as Kelthane® or Malathion® can be used, but the plant must be removed from the pond to avoid killing any beneficial insects, frogs or fish found in the pond. Insecticide applications for mites must be repeated for effective coverage.

The China Mark moth can leave its mark in the water garden. It forms a small bag or sandwich out of pieces of water lily leaves, leaving unsightly holes in the leaves. For most water gardens, pinching off the affected leaves or larvae works best. For a heavy infestation, BT (*Bacillus thuringiensis*) works well but will only control the caterpillar larvae. BT will not harm fish or plants found within the pond. Other types of caterpillars, such as climbing cutworm, can cause considerable damage to lily leaves and should be removed by hand as soon as they are spotted. BT also can be used as a control.

Ramshorn snails tend to eat plant leaves, unlike pond snails that tend to eat debris on the bottom and sides of the water garden. One method of control is to place a piece of lettuce in the water overnight. The snails will be drawn to it and can be easily removed the following morning by removing the piece of lettuce. Fish are also helpful in controlling snail populations as they eat the clear jelly-like egg masses.

In ponds with no fish, mosquitoes may become a problem. In most cases, fish do a very good job of controlling the mosquito larvae (a gray aquatic larvae, that when disturbed "wiggles" about). The mosquito larvae do not harm plant material, but should be controlled to reduce the adult mosquito population. Mosquito Dunks®, a strain of BT, works well against mosquito larvae.



Although water gardens are free of most diseases, hardy water lilies can contract crown rot. This disease causes one-half of the plant to turn yellow while the other half is still green. When the disease is detected, the plant should be removed and the diseased part cut out and discarded. The healthy remaining plant part should be cleaned of old soil and repotted.

Algae Control

One major problem that most water gardeners experience is algae or green water. It clouds the water with a green film, causing the pond to look unsightly and sometimes smell poorly. Algae is found in almost all water and are simple plants that reproduce by spores. When the pond is initially filled, as well as in the spring after the ice thaws, algae will begin to use nutrients that are in the water. The algae will begin to multiply rapidly or "bloom." They will grow rapidly until all of the excess nutrients found in the water have been exhausted. The algae will then begin to clear up. This process can take between two and three weeks. One of the major causes or contributors to algae growth is an over population of fish. As plants begin to grow, they use a good portion of the waste that fish produce. But, if the fish population is too large, the plants will not be able to keep up and algae will increase.

There are several methods of algae control. The easiest control method is with dyes that stain the water. Most dyes stain the water without harming fish or plants. Caution should be observed when using copper-based dyes because used at excessive rates, they can kill or injure plants, fish or other animal life in the pond. Copper-based dyes are typically blue in color. Dyes work by depriving algae of the light needed to reproduce and photosynthesize. Oxygenator or submerged plants may not be able to survive in this poor light environment, so other means of supplying oxygen may be needed, such as an air pump. Another drawback of dyed water is that the fish are difficult to see though the dye unless they are very near the surface.

Use barley straw or barley straw extract (there is some debate as to the effectiveness of barley extract) is an effective preventive method against the growth of algae. Straw or extract should be placed in the pond before the initial spring algae "bloom." Barley

straw is not an effective control for algae after it has become a problem. Barley straw should be added to the pond at a rate of 0.5 to 1.5 ounces of straw per 10 square feet of water surface area. Excess straw can cause anaerobic conditions and should be avoided. The straw should be applied loosely so that the straw is at or near the water surface. A cage or net can be used to contain the straw. On large ponds, straw may need to be placed in multiple locations. Most barley products will last up to six months. They should be removed at the end of the season.

A water garden with crystal clear water is an attainable goal but requires more time and maintenance than a garden with either stained or slightly green water. Several chemicals are available to help in maintaining a clear pond. Many are composed of enzymes or bacteria that digest excess waste or may cause the algae and other unwanted items in the water to clump together for easy removal. Some of crystal clear products include Aqua-zyme®, Aqua Rem®, No-Algae®, Crystal Lagoon® and Clear Pond Treats All®.

Another way to obtain a clear pond is to use a biological filter. These filters are located out of the pond near the edge of the water garden. They can be unsightly so some degree of creative landscaping should be used to conceal them. Biological filters consist of gravel or foam with different sized pores. Water is pumped into the large-sized rock or foam. The larger debris is caught on the surface of the foam or rock where beneficial microbes digest excess nutrients and begin breaking the debris down. The water then goes to the second layer, which usually consists of smaller gravel or foam, where microbes clean the water further. Once it passes through this stage, the water can either go on to a finer stage of cleaning or can be pumped back into the pond. Microbes must be added to the filter in order to establish the first colony. They are usually self-sustaining until the following year at which time additional microbes should be added.

Ultraviolet (UV) sterilizers or UV clarifiers can be used alone or with biological filters. Water from the pond passes under the UV light which then kills the algae as well as harmful bacteria. Using a biological filter and an ultraviolet strainer is the most effective method for achieving clear water.

FISH in the garden



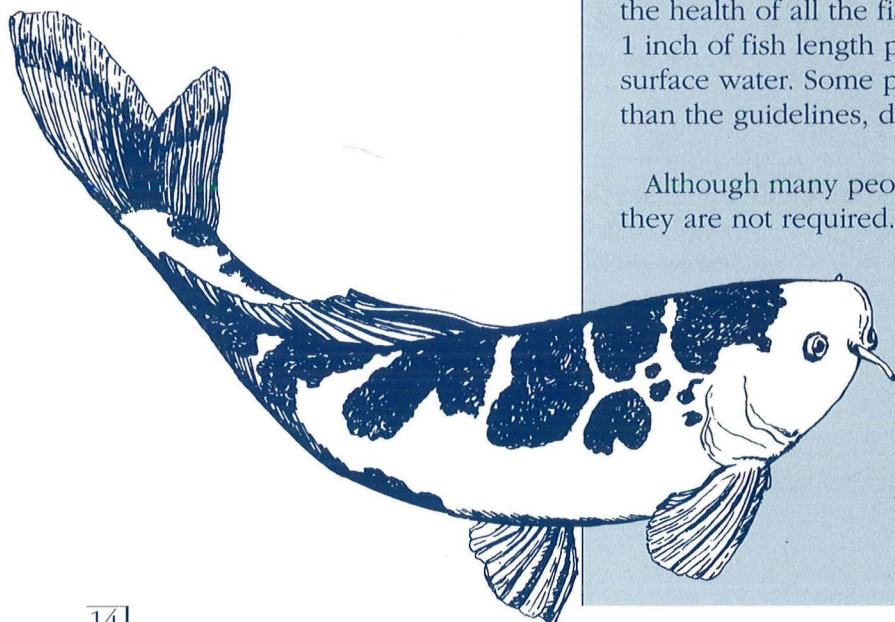
As previously noted, fish are a major contributor to algae growth. They also can cause damage to plants in the pond by eating the leaves. Koi, as well as large goldfish, can easily devour almost any aquatic plant leaf growing on or under the water in a short period, especially new tender leaves. Fish also will move or uproot plants in search of excess food and insects or for places to lay their eggs. Coarse rock, such as lava rock, may prevent fish from digging in the pots because the coarse rock irritates their scales.

Fish should be fed at approximately the same time each day, either in the morning or the afternoon. This allows the fish to group in anticipation of feeding time, which results in less wasted food. Feeding once a day is

sufficient. Feeding fish more than can be consumed in five minutes can result in decaying food. This is not healthy for the fish and it also contributes to algae growth.

Fish can multiply abundantly. In a well-established water garden, fish can breed several times during a Nebraska summer. While the adult fish naturally eats many of the eggs and young fish, enough will survive to add to the pond's population. To maintain a proper balance, fish must be removed! Neglecting to do this is a guarantee that algae will become a problem, as well as potentially endanger the health of all the fish in the pond. A general guideline to follow is 1 inch of fish length per five gallons of water or per square foot of surface water. Some ponds will be able to support more or less fish than the guidelines, depending on pond design and water quality.

Although many people enjoy fish as part of their water garden, they are not required. In some cases, fish can be separated from the plants by an invisible screen or physical barrier.



A general guideline to follow for water garden fish is 1 inch of fish length per five gallons of water or per square foot of surface water.

Water gardens are an increasingly popular component of Nebraska landscapes. The benefits they bring to the home or commercial landscape, including interesting plants, the cooling sound and character of water, animal habitat, and a focus for outdoor living spaces, are maximized when the garden is properly designed, located, constructed and maintained. Consider the following points carefully as you plan your water garden:

- **Design** — use complementary shapes to existing landscape features, and incorporate plants and elements in the surrounding landscape that enhance the visibility and aesthetics of the water garden while minimizing additional maintenance requirements. Select a size and depth that correspond to maintenance capabilities and budgets as well as supports the plants and animals desired, and consider how “clean” the water needs to be, and plan for the needed chemicals or filtering system to meet the desired standard.

- **Location** — provide for proper sun exposure to support desired plants, maximize visual interest/focus in the landscape, and provide for good physical access for proximity to water sounds and efficient maintenance.

- **Construction** — use quality materials, provide a solid level base at multiple depths, provide for overflow capability in large ponds, and provide for good drainage in the surrounding landscape away from rather than into the water garden.

- **Maintenance** — select plants that are adaptable to the conditions of the garden, use plants in proper combinations and quantities to promote water quality and garden health, and commit to preventative procedures and seasonal maintenance requirements to establish and maintain long-term water garden beauty and healthy plant and animal living conditions.



SUMMARY

Information Sources

Gaussoin, R. E. 1999. Algae Control in Ponds With Barley Bales: On-site Results in Nebraska. Center for Grassland Studies Newsletter 5(2).

Lilypons Water Gardens. 1997. Water garden catalog.

Slocum, P. D, P. Robinson, with F. Perry. 1996. Water Gardening, water lilies and lotuses. Timber Press, Portland, OR.

Stigall Water Gardens. 1997. Water garden catalog.

Plant Material Sources

Lilyblooms, The water garden store. 932 South Main St., North Canton, Ohio 44720, (800) 921-0005.

Lilypons Water Gardens, PO Box 10 Buckeystown, Maryland 21717-0010, (800) 999-5459.

Patio Garden Ponds, PO 890402, Oklahoma City, Oklahoma 73189-0402, (800) 487-LILY.

Paradise Water Gardens, 14 May St., Whitman, Massachusetts 02382, 617-447-4711.

** Many local garden centers will carry a limited supply of water plants and goods, and no endorsement is intended nor criticism implied of companies not listed.*